

STUDIES ON VENEZUELAN HEPATICAE, II.

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Family CEPHALOZIACEAE

30. Cephalozia venezuelana Schust., sp. n.

Species speciei C. bicuspidatae similis (ramificatione libera typi Frullaniae, inflorescentiis autoeciis atque orientatione foliorum obliqua) distincta, autem, ut lobi foliorum ad basim tantummodo 4-5 cellularum latitudine; perianthium lobulato-ciliatum, ciliis partim 3-4 cellulas longitudine. Type. Estado Merida: Sierra Nevada de Merida, 2650 m. (RMS & L. Ruiz-Teran 76-1472a).

Keying to C. subforficata in Fulford's key (1968, pp. 311-12), but at once distinct in the deeply (to 0.5-0.6) bifid leaves, with erect or divergent segments; autoecious inflorescences; elongated cells of the perianth mouth cilia. Perhaps a mere subspecies of C. bicuspidata, but the perianth mouth is much more deeply incised-lobulate, with lobes longly ciliate.

Family CEPHALOZIELLACEAE

The recent treatment of Fulford (1976) unfortunately contains some errors and omissions. It fails to correctly state the sexuality of some taxa; the diagnoses lack adequate precision and fail to mention, i.e., presence or absence of flagella, branching patterns, spatial relationships of gynoecia and androecia -- all criteria of major significance in defining the taxa. Thus it has been impossible to utilize her treatment -- especially since she also fails to even distinguish the subgeneric units used by all workers since the time of Muller (1947); consequently I have been unable to place two of several taxa collected in Venezuela.

31. Cephaloziella (Prionolobus) grisea Schust., sp. n.

Planta tenuis flexuosaque, remote pinnulata ramis laterali-intercalaribus (ramis ventrali-intercalaribus typi Frullaniae non visis); plantae siccatae albido-virides ad albido-cinereas, ob membranas cellularum sine colore et maxime crassas atque ob cuticulam valde papillosam. Amphigastria hic illic distincta, lamellata. Gynoecia interdum purpurascens; cacumina surculorum gemmipara purpurascens; gemmae maturae purpurascens, 1(2)-cellulares, irregulariter (3)4-5(6)-angulate, angulis rotundatis pachydermatisque. Plantae heteroeciae. Type. Estado Merida: Sierra Nevada de Merida, 4150 m. (RMS & L. Ruiz-Teran 76-1499a).

Gemma form fails to exactly correspond to that in Prionolobus -- or to any other of the gemma-derived segregates given in Douin (1920),

yet they fall nearest to this. The loosely complicate-folded, spinose-dentate margins of larger leaves are also as in that subgenus. Yet Prionolobus supposedly lacks underleaves -- even though vigorous axes of C. grisea may bear them. In the type of Prionolobus, C. turneri, and its near allies, gynoecia are acrogynous. All of the dozen gynoecia of C. grisea seen were on varyingly abbreviated axes -- more than half occupied very short lateral-intercalary branches.

32. Cephaloziella (Cephaloziella) stolonifera Schust., sp. n.

Plantae autoeciae, androeciis gynoeciisque plerumque fere juxtapositis; gynoecia in ramis intercalaribus abbreviatisque semper sita, ex axibus longis, foliaceis (saepe  $\sigma$ ) enascentia; amphigastria distincta;  $\varnothing$  bracteae ad basim connatae; ramificatio terminalis carens; stolona microphyllosa abundantia; amphigastria nulla aut vestigialia et 1-2-cellularia. Type. Estado de Santo Domingo: Lago Los Patos, 3650 m. (RMS & L. Ruiz-Teran 76-980.)

Although lacking gemmae, this taxon clearly belongs to the C. elachista-spinigera-pulcherrima complex, as is evident from the criteria cited in the Latin diagnosis above. Distinct from all three allied species in the copious development of flagelliform, microphyllous axes. Unlike in C. pulcherrima Schust., of Australasia, to which it is perhaps most nearly allied (the two taxa share basally conspicuously connate bracts + bracteole), gynoecia and androecia are never clustered and may, indeed, be relatively widely spaced.

Family LEJEUNEACEAE

33. Cyrtolejeunea venezuelana Schust., sp. n.

Plantae vivide gramineo-virides; C. antillanae Schust. cognatae, differentes, autem, eo quod: plantae minores, lobis dorsalibus magis convexis, magis elevatis atque satis abbreviatis; longitudo carinae ca. 0.55-0.7 longitudinis folii; pars lobi dorsalis a carina distalis tantummodo 9-10 cellularis lata; amphigastria incisuram apicalem non profundam sed acutam saepe habentia; gynoecia (saltem plerumque) in axibus primariis foliaceis cum duobus innovationibus sita. Type. Estado Tachira: Villa Paez, 2450 m. (RMS & L. Ruiz-Teran 76-2078a).

Although the lobular apex suggests an affinity to C. antillana, the preceding distinctions prohibit any close relationship to that taxon.

Oil-bodies are minute, rather numerous, and homogeneous. The stem has 7 rows of large, rather leptodermous to feebly thick-walled cortical cells surrounding as few as 4 or as many as 9-15 rows of much smaller, almost wholly thin-walled medullary cells.

34. Cheilolejeunea (Strepsilejeunea) nana Schust., sp. n.

Plantae minimae albidaeque; ut videtur dioeciae ( $\sigma$  non visa); perianthium inflatum, a sectione transversa visum pentagonali, breve, lato-ovoideum, longe rostratum; una innovatio subfloralis semper praesens; caulis ordines cellularum 7 corticalium + 4(5) medulloarum habens. (1)2 guttae olei omni in cellula, e paucis segmentis compo-

sitae, crescenticae. Type. Estado Tachira: Below Paramo de Tama, 2560 m., (RMS & L. Ruiz-Teran 76-2061b).

Perianths are short-ovoid, inflated and almost included, 5-keeled only in the distal half and very long beaked, the beak orange. Lobe cells are convex, the convexity thick-walled -- this is especially distinct along the keel which is papulose-tuberculate.

35. Cheilolejeunea (Strepsilejeunea) erostrata Schust., sp. n.

Plantae autoeciae, gynoecia in ramis foliaceis longis (tum 2 innovationes habentes) aut in ramo brevi (tum unam innovationem habentes) sita; androecia semper basalia, in ramis brevibus sita; caulis 7 cellulas corticales magnas, satis leptodermatas et ca. 17-19 ordines cellularum medullarum, fere leptodermatarum minimarumque habens; perianthium erostratum, superficie dorsali plana ad concavam, carinis lateralibus obtusis et male definitis, superficie ventrali singulari carina inflata humili praedita (perianthium ita obtuse trigono-compressum). Type. Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1921e).

The perianth form is unique within subg. Strepsilejeunea, so far as my experience with this ill-defined subgenus goes. Underleaves are large, adaxially concave, and inserted on a short, inverted U.

36. Cheilolejeunea (Strepsilejeunea) invaginata Schust., sp. n.

Plantae autoeciae; gynoecia in axibus longis (2 innovationes habentia) aut interdum in ramis brevibus (1 vel 2 innovationes habentia) sita; caulis 7 cellulas corticales rigidas, pachydermatas et 10-12 ordines cellularum medullarum, his ca. 0.7-0.8 diam. cellularum corticalium, membranis solidis habens; perianthium erostratum (ore invaginato-depresso) longum, longe emergens, distaliter 5-carinatum. Type. Estado Tachira: Paramo de Tama, 2490 m. (RMS & L. Ruiz-Teran 76-2056a).

Agreeing with the two preceding species in the whitish gray to whitish color of living plants. All three taxa bear sharp leaf lobes but only C. nana has a "normal" Cheilolejeuneoid perianth; the other two taxa are quite distinct in perianth form.

37. Drepanolejeunea urceolata Schust., sp. n.

Lobi remoti, suberecti, tenuissimi, lanceolati (longitudine: latitudine = 6-9:1), serrulati, apex non falcatus, 1-2 cellulis terminatus; dentes triangulares, multi obliqui, unicellulares aut cellulis marginalibus eminentibus formati; serrulationes marginis dorsalis 8-11. Dens lobularis perelongatus (4-6:1), uncinatus, attenuatus. Cellulae pachydermatae, sine trigonis et incrassationibus mediis, convexae sed non armatae. Ocelli 3-4 in linea interrupta ordinati, ocello basali e basi una cellula remota, ocello proximo e basali una cellula remoto. Plantae autoeciae. Gynoecia in ramis lateralibus brevibus normaliter sita, innovationem sterilem habentia; perianthium urceolatum, basi substipitata, distaliter non contractum, sed 9-10 lobos triangulares expandentes acutos et dentatos ferens.

Type. Estado Merida: Rio Frias, Sierra Nevada de Merida, 2730 m. (RMS & L. Ruiz-Teran 76-1497b).

Unique not only in Drepanolejeunea, but in the Lejeuneaceae in the unique perianths that lack any distal constriction, being campanulate-urceolate, with a flaring lobed and toothed mouth.

38. Aureolejeunea Schust., gen. n.

Plantae laxae repentes, substrato semper solute affixae; aureae ad fulvas, minime in sectoribus maturis; cortex in 16 vel pluribus ordinibus ordinatus; merophyta ventralia 2 vel 4 cellulis lata; folia convexa, in margine integra; lobulus ad basim atque secundum carinam inflatus, margine discreto plano appressoque; papilla hyalina distalis, marginalis, in parte media sinus sita. Amphigastria non lobata, latiora quam longa, in arcu lato aut linea semicirculari inserta. Cellulae solidae, trigona crassa tumescencia aequilateralia habentes; guttae olei 2-4 omni in cellula, magnae, crasse botryoideae. Plantae autoeciae. Androecia basalia, cladogena; bracteola tantummodo ad basim reperta. Gynoecia in axibus foliaceis longis ad plus minusve breves sita; 1-2 innovationes habentia. Perianthium 4, 5 aut (distaliter) 10 carinas subcutas ad obtusas rotundatasve habens. Seta 12 + 4 ordines habens. Type. A. aurifera Schust., sp. n.

The lobule and seta morphology suggest Leucolejeunea, but Aureolejeunea is distinct in the (a) 2-4 (rather than 1) oil-bodies per cell; (b) nonadnate, loose and often shingled mode of growth; (c) presence of cell wall pigments; (d) coarse trigones; (e) very variable perianth form; (f) tendency for the keel of  $\sigma$  bracts to be winged.

In addition to 4 Venezuelan taxa, a fifth occurs in Indomalaya; it must go into a distinct section and the two are separable as follows:

1. Leaf lobules with proximal portions of anterior margin incurved but distal portions (including the externally evident apical tooth and hyaline papilla) flatly appressed to lobe; apical tooth acute to blunt to rounded, never inflexed. Lobule strongly elongated (0.4-0.5 length of lobe). Autoecious. Neotropical.

Sectio Aureolejeunea

1. Leaf lobules with free margin inflexed throughout; no distinct apical tooth, the lobule apex a rounded, inflexed appendiculum. Lobule abbreviated (0.2-0.3 length of lobe). Dioecious. Indo-malayan.

Sectio Omphalanthopsis Schust., sect. n.

39. Aureolejeunea paramoensis Schust, sp. n.

Perianthium in triente distali 10 carinis subcutis (3 dorsali-bus, 5 ventralibus, 2 lateralibus) praeditum; rostrum vix perceptibile; cellulae folii non elevatae; "dens" apicalis lobularis non dentiformis, rotundatus ad obtusum. Type. Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1920a).

The only species of the genus with a 10-plicate perianth.

40. Aureolejeunea fulva Schust., sp. n.

Perianthium 2 carinas laterales rotundatas perinflatas atque 2 carinas ventrales similes, inferiores, autem, et minus definitas habens; superficies dorsalis perianthii plana ad concavam, ecarinata; rostrum vestigiale, recessum, carinis lateralibus distaliter inflatis. Cellulae folii non tuberculata-elevatae. Type. Estado Merida: La Carbonera, 2300-2350 m. (RMS & L. Ruiz-Teran, 76-305).

The perianth is unique in the genus. Unlike the other three species, this plant shows almost no cell wall pigmentation.

41. Aureolejeunea aurifera Schust., sp. n.

Perianthium 5 carinas bene definitas habens, carina dorsali non aut vix inferioribus quam ventralis, carinis rotundatis ad satis compressas; omnia cellula folii projectione indrassata mammiliformi aut tuberculo armata; apices lobi decurvato-involuti, subcucullati; merophyta ventralia ca. 4 cellulis lata. Type. Estado Merida: Sierra de Santo Domingo, paramo at 3700 m. (RMS & L. Ruiz-Teran 76-945).

The only species of the genus with the cells tuberculate-elevated. Perhaps closest to the next in perianth form, but very different in the strongly concave leaf lobes, with the apices almost hooded.

42. Aureolejeunea quinquecarinata Schust., sp. n.

Perianthium 5 carinas aequales maxime acutas longasque habens; cellulae folii aequae convexae, non armatae; apices lobi non inflexi, lobis solummodo convexis; merophyta ventralia 2 cellulis lata. Type. Estado Tachira: Paramo de Tama (RMS & L. Ruiz-Teran 76-1921d).

Distinct from the preceding three species in the sharply and longly quinquecarinate perianths.

43. Physantholejeunea Schust., gen. n.

Plantae viventes smaragdinae, fere aut omnino sine pigmentatione secundaria; lamella media opaca nulla; apices foliorum caulis cellulis hyalinis atque digitiformibus in apice aggregati armati; margo discretus lobularis per cellulas maxime angustissimas elongatas praetexus; corpora olei vestigialia ut guttulae olei minutae apparentia; ocelli sparsi, in lobis, lobulis atque amphigastriis praesentes; utriculi nulli; amphigastria non lobata. Carina  $\sigma$  bractearum acuta, interdum distaliter alata. Type. Lejeunea portoricensis Hpe. & G., Linnaea 25:352, 1852 = Physantholejeunea portoricensis (Hpe. & G.) Schust., comb. n.

The plant has been placed into both Neurolejeunea and Ceratolejeunea. Stem anatomy eliminates it from the former; numerous criteria separate it from the latter (i.a., the contrast between adnate primary and ascending to pendulous or spreading secondary axes; lack of wall pigments and of a differentiated middle lamella; lack of distinct oil-bodies in nonocellar cells; lobule morphology; the compound irregular surface papillae of the cells; the peculiar hyaline cells

of lobe apices of the leaves of primary stems).

44. Ceratolejeunea subg. Caduciloba Schust., subg. n.

Subgenus a subg. Ceratolejeunea distinctum eo quod lobulus tenuis ampulliformis, infra apicem expandentem constrictus, 0.55-0.75 long. lobi, margine omnino involuto; ♀ bractee edentatae numquam utriculos habentes. Type. Ceratolejeunea patentissima (Hpe. & G.) Evs.

Including besides the type a second Venezuelan species:

45. Ceratolejeunea (Caduciloba) andicola Schust., sp. n.

Plantae minutae, nitidae, clare brunneae; caulis 4-5(6) ordines medullosos cellularum fere leptodermatarum habens; folia persistentia, vix falcata, oblique patentia; amphigastria parva, remota, per riam clausam 1(2) cellulis profundam paululum incisa, aspectu, autem, non lobata. Type. Estado Tachira: Paramo de Tama, 3050 m. (RMS & L. Ruiz-Teran 76-1955a).

Unlike the type, which has 1-2 basal ocelli (in some populations, at least) and single oil-bodies per cell, this species seems to uniformly have single ocelli or to lack them, and has 1-2(3) oil-bodies per cell. The superficially unlobed underleaves at first suggest a species of Dicranolejeunea is at hand.

46. Cyclolejeunea (Prionocolea) marginata Schust., subg. et sp. n.

Plantae subvirides ad albido-virides, subpellucidae. Caulis ordines cellularum 7 corticalium atque ca. 10 medullosorum habens. Lobi cellulis parvis quadratis non-eminentibus marginatus, ita non denticulati. Amphigastria usque ad 0.65 bifida. Ocelli nulli. Reproductio asexualis nulla. Plantae autoeciae; androecia ex 1-3(4) partibus bractearum solum constantia, cladogenea, sessila. Plera gynoecia in ramis lateralibus brevibus sita, innovationem brevem, sterilem ferentia, alia gynoecia ad apicem caulis, 1-2 innovationes steriles habentia. Perianthium obcordatum, + compressum, carinis lateralibus alas binas lacerato-laciniatas habentibus; carina ventralis aut carinae binae interdum distinctae et similiter armatae. Type. Estado Tachira: Bosque Valencia below Paramo de Tama, Villa Paez (RMS & L. Ruiz-Teran 76-2279).

Although at first believed to be a Prionolejeunea (because of the apparently consistently sterile and usually short and weak ♀ innovations; lack of ocelli, and because of the lacerate-lacinate paired wings of the lateral perianth keels), the smooth-margined leaf lobes and the occasionally paired innovations of acrogynous gynoecia suggest such a disposition is unnatural. The position within Cyclolejeunea is hardly more satisfactory, and subg. Prionocolea could be placed with almost equal justification into either genus. Unique, and not found in other taxa assigned to Prionolejeunea or Cyclolejeunea, is the marked tendency on larger perianths for one or both ventral angles ("keels") to bear partial or complete, lacerate wings -- much like the lateral keels. Possibly deserving

generic status.

47. Amphilejeunea viridissima Schust., gen. et sp. n.

Planta + nitida, mollis, clare hyalineque viridis (defuncta subflava), crescens imbricata aut pulvinata (in virgis ramulisque in regione "paramo" dicta colens); cellulae corticales magnae, laxae, in 7 seriebus ordinatae; cellulae medullosae in 18-22 seriebus ordinatae. Folia convexa, ad apicem rotundata, in margine integra; lobulus papillam hyalinam paululum entaliter summotam habens. Amphigastria magna, imbricata, non lobata, margine anguste revoluta. Plantae dioeciae. Androecia subsessilia, in ramis brevibus sita; bracteola solum ad basim reperta. Gynoecia in axibus primariis foliaceis, 1(2) innovationes subflorales habentia; bracteola non lobata. Perianthium maturum longe stipitatum (stipite saepe 2-3 plo longiore quam perianthium), 5-carinatum, carinis 2 alis late patentibus, 3-4 vel plures cellulas latitudine, distaliter armatis. Seta 12 + 4 ordines cellularum habens. Type. Estado Merida: Sierra de Santo Domingo, between Lagunita Verde and Laguna los Patos, 3700 m. (RMS & L. Ruiz-Teran 76-905b).

The unlobed leaves, ♀ bracts, and slightly entally displaced hyaline papilla of the lobule suggest the Ptychanthoideae, from which stem and seta anatomy separate it. Within Lejeuneoideae I know of no near allies. Common on shrubs and small trees in and near the paramo margin.

48. Diplasiolejeunea papilionacea Schust., sp. n.

Species D. johnsonii similis ut lobi foliorum maxime convexi, apicibus marginibusque lobi perspicue decurvato-involutis; differens eo quod amphigastria enormia, lobis ovatis 22-28 vel plures cellulas latitudine, adaxialiter convexis, differens necnon ut plantae unisexuales, et dens apicalis lobuli omnino 2 cellulas latitudine, plerumque 6-7 cellulas longitudine. Type. Estado Merida: Trail to Rio Frias, below 2500 m., in cloud forest below Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1489).

The underleaf lobes, in width and orientation, simulate the front wings of a butterfly, hence the species name. Underleaf form suggests the African D. runssorensis Steph., but this has underleaf lobes 16-18 cells broad.

49. Aphanolejeunea subsphaeroidea Schust., sp. n.

Folia remota, dimorphica, latissima in parte media, folia lobulata lata (ca. 1.1-1.2:1), perspicue inflata subsphaericaque; lobus convexus, apice valde flexo-involuto; lobulus permagnus, ca. 0.9 maior quam lobus longitudine areaque, perspicue inflatus; apex lobuli 2 dentes iuxtapositos, dentes distali bicellulari, habens. Folia elobulata ovato-elliptica et ca. 6 cellulas latitudine. Plantae dioeciae. Type. Estado Merida: Sierra Nevada de Merida, 2730 m., on trail to Rio Frias (RMS & L. Ruiz-Teran 76-1500).

Unique in Aphanolejeunea in the strongly inflated-appearing

leaves on which the lobe apex is so deflexed-involute that this apex results in the opening to the water-sac being displaced toward the substrate.

## FOOTNOTES

1 Esta investigación fue sufragada con fondos suministrados por el Consejo de Desarrollo Científico y Humanístico (C.D.C.H.) de la Universidad de los Andes, Mérida, Venezuela, Proyecto FA-17-76. The National Science Foundation (USA) provided funds for the air transport to Venezuela. I am indebted to Profs. Oswaldo Lopez Figueras and Luis Ruiz-Teran for innumerable favors and, to the latter, for intensive and extensive aid in the field. I am also indebted to Dr. Hannah Croasdale for the Latin diagnoses.

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Sectio Omphalanthopsis Schust., sect. n. Sectio a sectione Auriferain distincta ut inflorescentiae dioeciae, lobuli breves, margine discreto, et apex latus appendiculiformis omnino inflexus atque sine dissectione invisibilis. Type. Aureolejeunea decurrens (Steph.) Schust., comb. n. [Basionym: Hygrolejeunea decurrens Steph., Hedwigia 35:101, 1896].

This species has been erroneously assigned to Leucolejeunea by Mizutani (Jour. Hattori Bot. Lab. no. 40:443, 1976).

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